

CLAIMS

1. A lithographic apparatus comprising:
 - an illumination system configured to provide a beam of radiation;
 - a support structure configured to hold a patterning device, the patterning device configured to impart the beam with a pattern in its cross-section;
 - 5 a substrate table configured to hold a substrate;
 - a projection system configured to project the patterned beam onto a target portion of the substrate; and
 - a liquid supply system configured to provide an immersion liquid to a space between the substrate and the projection system, the liquid supply system comprising a barrier
 - 10 member extending along at least a part of the boundary of the space and being in a position relative to an object on the substrate table so that any capillary pressure generated by the immersion liquid between the barrier member and the object is not large enough to constrain the immersion liquid in the space,
 - wherein no seal is provided between the barrier member and the object.
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2. An apparatus according to claim 1, further comprising at least one outlet to remove immersion liquid, the at least one outlet being radially outwardly of the barrier member.
3. An apparatus according to claim 2, wherein the at least one outlet is on the substrate
- 20 table.
4. An apparatus according to claim 2, wherein the at least one outlet is suspended above the substrate table.
- 25 5. An apparatus according to claim 1, wherein the object comprises the substrate and a distance between the barrier member and the substrate is at least 50 μm .

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6. An apparatus according to claim 4, wherein the object comprises the substrate and a distance between the barrier member and the substrate is one of substantially 100 μm , 150 μm or 300 μm .
- 5 7. An apparatus according to claim 1, wherein the barrier member is mechanically isolated from the projection system.
8. An apparatus according to claim 1, wherein the barrier member is connected to at least one of a base frame that supports the substrate table and a projection system frame that
10 supports the projection system.
9. An apparatus according to claim 1, wherein the barrier member is free to move in the direction of an optical axis of the projection system.
- 15 10. An apparatus according to claim 1, further comprising an actuator configured to adjust at least one of the height and tilt of the barrier member relative to the object.
11. An apparatus according to claim 1, wherein the object comprises at least one of the substrate, a sensor and a shutter.
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12. An apparatus according to claim 1, wherein the barrier member comprises at least one inlet to supply the immersion liquid to the space.
13. A device manufacturing method comprising:
25 providing an immersion liquid to a space between a substrate on a substrate table and a projection system, a barrier member extending along at least a part of the boundary of the space;
allowing immersion liquid to leak between the barrier member and an object on the substrate table by positioning at least one of the barrier member and the object so that any
30 capillary pressure generated by the immersion liquid between the barrier member and the object is not large enough to constrain the immersion liquid in the space; and

projecting a patterned beam of radiation onto a target portion of the substrate using the projection system.

14. A device manufacturing method according to claim 13, comprising removing
5 immersion liquid through at least one outlet positioned radially outwardly of the barrier member.

15. A device manufacturing method according to claim 14, wherein the at least one outlet is positioned on the substrate table.

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16. A device manufacturing method according to claim 13, wherein the object comprises the substrate and a distance between the barrier member and the substrate is at least 50 μm .

17. A device manufacturing method according to claim 13, wherein the barrier member is
15 mechanically isolated from the projection system.

18. A device manufacturing method according to claim 13, comprising moving the barrier member in the direction of an optical axis of the projection system.

20 19. A device manufacturing method according to claim 13, wherein the object comprises at least one of the substrate, a sensor and a shutter.

20. A device manufacturing method according to claim 13, comprising supplying the immersion liquid, from the barrier member, to the space.

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21. A lithographic apparatus comprising:
an illumination system configured to provide a beam of radiation;
a support structure configured to hold a patterning device, the patterning device configured to impart the beam with a pattern in its cross-section;
30 a substrate table configured to hold a substrate;

a projection system configured to project the patterned beam onto a target portion of the substrate; and

a liquid supply system configured to provide an immersion liquid to a space between the substrate and the projection system, the liquid supply system comprising at least one
5 immersion liquid inlet port provided on a boundary of the space,

wherein the immersion liquid is not substantially confined in the space so that immersion liquid can flow out of the space.

22. An apparatus according to claim 21, further comprising at least one immersion liquid
10 outlet port, the at least one immersion liquid outlet port being radially outwardly of the at least one immersion liquid inlet port.

23. An apparatus according to claim 22, wherein the at least one immersion liquid outlet
is on the substrate table.

15 24. An apparatus according to claim 22, wherein the outlet is suspended above the substrate table.

25. An apparatus according to claim 21, wherein a distance between the barrier member
20 and the substrate is at least 50 μm .

26. An apparatus according to claim 21, wherein the at least one immersion liquid inlet port is mechanically isolated from the projection system.

25 27. An apparatus according to claim 21, wherein the least one immersion liquid inlet port is connected to at least one of a base frame that supports the substrate table and a projection system frame that supports the projection system.

28. An apparatus according to claim 21, wherein the at least one immersion liquid inlet
30 port is free to move in the direction of an optical axis of the projection system.

29. An apparatus according to claim 21, further comprising an actuator configured to adjust at least one of the height and tilt of the least one immersion liquid inlet port relative to the substrate.

- 5 30. A lithographic apparatus comprising:
an illumination system configured to provide a beam of radiation;
a support structure configured to hold a patterning device, the patterning device configured to impart the beam with a pattern in its cross-section;
a substrate table configured to hold a substrate;
10 a projection system configured to project the patterned beam onto a target portion of the substrate; and
a liquid supply system configured to provide an immersion liquid to a space between the substrate and the projection system, the liquid supply system comprising at least one immersion liquid inlet port,
15 wherein an at least one immersion liquid outlet port is provided only at least one of on the substrate table and suspended above the substrate table.

31. An apparatus according to claim 30, wherein the at least one immersion liquid outlet port is radially outwardly of the at least one immersion liquid inlet port.

20 32. An apparatus according to claim 30, wherein a distance between the at least one immersion liquid inlet port and the substrate is at least 50 μm .

33. An apparatus according to claim 30, wherein the at least one immersion liquid inlet
25 port is mechanically isolated from the projection system.

34. An apparatus according to claim 30, wherein the at least one immersion liquid inlet port is connected to at least one of a base frame that supports the substrate table and a projection system frame that supports the projection system.

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35. An apparatus according to claim 30, wherein the at least one immersion liquid inlet port is free to move in the direction of an optical axis of the projection system.

36. An apparatus according to claim 30, further comprising an actuator configured to
5 adjust at least one of the height and tilt of the at least one immersion liquid inlet port relative to the substrate.